3. The apparatus of claim 1, wherein the sensor module further comprises a global positioning system receiver adapted to synchronize the operation of the sensors for synchronizing the operation of a sensor to a common time.

4. The apparatus of claim 1 further comprising:
a feedback control circuit adapted to provide force balanced feedback coupled to the sensor and for providing insensitivity to tilt; and
a controller adapted to monitor the operation of the apparatus coupled to the sensor.

5. The apparatus of claim 1 further comprising:
a controller coupled to the sensor module for controlling the operation of the apparatus;
wherein the sensor module comprises a 3-axis magnetometer for determining the orientation of the sensor module.

6. The apparatus of claim 1 further comprising:
a crystal assembly coupled to the sensor module for providing a force in order to measure the ground coupling and vector fidelity of the sensor; and
a controller coupled to the sensor module for controlling the operation of the apparatus.

7. The apparatus of claim 1, wherein the sensor module provides a digital output signal.

8. The apparatus of claim 1, wherein the one or more seismic recorders are radio seismic recorders.

9. The apparatus of claim 8, wherein the radio seismic recorders are integral to the sensor modules.

10. A method of acquiring seismic data comprising:
sensing seismic energy with one or more sensor modules, wherein the one or more sensor modules comprise one or more accelerometers; and
recording seismic data indicative of the seismic energy using a seismic recorder.

11. The method of claim 10 further comprising providing a forced feedback compensation to the sensor for providing insensitivity to tilt.

12. The method of claim 11 further comprising determining the tilt angle of the sensor module; and
measuring the steady-state gravity field over a predetermined time period.

13. The method of claim 11 further comprising:
calibrating the sensor module to determine tilt information;
storing the tilt information within the sensor module; and
measuring an effect of gravity on the sensor module.

14. The method of claim 10, wherein the sensor module comprises a 3-axis sensor, the method further comprising:
determining the orientation of the 3-axis sensor, comprising:
performing a 3-dimensional measurement of a gravity field;
determining a gravity vector;
performing a 3-dimensional measurement of a magnetic field;
determining a magnetic vector; and
determining the direction of magnetic north and gravity down.

15. The method of claim 10 further comprising:
synchronizing the operation of the seismic sensor module;
wherein synchronizing the operation of a seismic sensor module
comprises using a global positioning system signal from a global positioning system receiver within the sensor module.

16. The method of claim 10 further comprising:
determining the position of the seismic sensor;
wherein determining the position of the seismic sensor comprises using
a global positioning system signal from a global positioning system receiver within the sensor module.

17. The method of claim 10 further comprising: synchronizing the acquisition by receiving a signal containing time information; and controlling the operation of the one or more accelerometers and the one or more seismic recorders using the signal.

18. The method of claim 10 further comprising determining the degree of coupling between the sensor module and the ground, by generating a force; recording a response of the sensor assembly to the force; and analyzing the response.

19. The method of claim 10 further comprising determining the vector fidelity of the sensor module comprising: generating a force; recording a response of the sensor assembly to the force; and analyzing the response.

20. The method of claim 10 further comprising determining the orientation of the sensor module, comprising: generating a force at a plurality of source points; recording a response of the sensor module to the force; and analyzing the response.

21. The method of claim 10 further comprising: determining the state-of-health of the sensor module, comprising: sending a bitstream to the sensor module; decoding, capturing, and looping-back the bitstream to the seismic recorder; and capturing and analyzing the bitstream by the seismic recorder, wherein analyzing the bitstream comprises determining a malfunction of the sensor module.

22. The method of claim 21, wherein determining the state-of-health includes using an ASIC coupled to a seismic recorder.

23. The method of claim 22 further comprising validating the contents of the ASIC.

24. The method of claim 21 further comprising:

operating the accelerometer; and

monitoring the operation of the accelerometer;

wherein monitoring the operation of the accelerometer comprises monitoring the accelerometer for instability to indicate a malfunction of the accelerometer or an excessive external acceleration.

25. The method of claim 10 further comprising:

determining the state-of-health for the sensor module comprising:

exciting the accelerometer with a bitstream; and

acquiring, analyzing and judging an output signal generated by the accelerometer;

wherein judging an output signal comprises judging a magnitude of the output signal to indicate a malfunction of the accelerometer.

26. The method of claim 25, wherein judging an output signal comprises judging a phase response of the output signal to indicate a malfunction of the accelerometer.

27. The method of claim 25, wherein judging an output signal comprises judging a total harmonic distortion of the output signal to indicate a malfunction of the accelerometer.

28. The method of claim 10 further comprising:

determining the state-of-health for the sensor module comprising:

operating the accelerometer for a period of time; and

analyzing an output signal generated by the accelerometer;

wherein analyzing an output signal comprises detecting an excessive root-mean-square amplitude response of the output signal to indicate a malfunction of the accelerometer or a noisy environment.

29. The method of claim 10 further comprising:
determining the state-of-health for the sensor module comprising:
operating the accelerometer; and
analyzing an output signal generated by the accelerometer;
wherein analyzing an output signal comprises analyzing an offset and a gravity cancellation magnitude of the output signal to detect a change in the inclination of the accelerometer.

30. The method of claim 10 further comprising:
determining the state-of-health for the sensor module comprising:
operating the accelerometers; and
monitoring one or more output signals generated by the accelerometers; wherein monitoring one or more output signals generated by the accelerometers comprises monitoring a vector sum of the self-measured coefficients of gravity of the output signals to detect a malfunction of the sensor assembly.

31. The method of claim 10 further comprising:
determining the state-of-health for the sensor module comprising:
operating the accelerometers;
driving two of the accelerometers at a reference frequency;
monitoring an output signal generated by the undriven accelerometer; and
rotating through all the accelerometers;
wherein monitoring an output signal comprises monitoring the magnitude of the reference frequency in the output signal of the undriven accelerometer to detect a malfunction of the sensor assembly.

32. The method of claim 10 further comprising:
determining the state-of-health for the sensor module comprising:
operating the accelerometers for a period of time;
removing DC offset from one or more output signals generated by the accelerometer to produce one or more resulting signals;
transforming the resulting signals from the accelerometers from Cartesian coordinates into polar coordinates; and

analyzing the polar coordinates;

wherein analyzing the polar coordinates comprises analyzing one or more peak and root-mean-square amplitude results to indicate a malfunction of the sensor assembly or a noisy acquisition environment.

33. The method of claim 10 further comprising:

determining the state-of-health for the sensor module comprising:

(a) operating the accelerometers;

(b) monitoring one or more output signals generated by the accelerometers;

(c) analyzing the output signals;

(d) changing the orientation of the sensor assembly; and

(e) repeating (b), (c) and (d) for a plurality of orientations;

wherein analyzing the output signals comprise calculating the sensor's angles with respect to gravity from a vector sum of the self-measured coefficients of gravity in any orientation; and

wherein analyzing the output signals further comprises analyzing sensor's angles with respect to gravity to indicate a malfunction of the sensor assembly.

Respectfully submitted,

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